

STUDIES ON THE OPISTHOBRANCHIATA: II. A New Tectibranch of the Genus *Philine*¹

By N. T. MATTOX

Department of Biology
University of Southern California, Los Angeles

Among the collections of the Allan Hancock Foundation, University of Southern California, are 19 lots of a tectibranch which have been collected from the coastal waters of southern California. Most of these collections are from near Santa Catalina Island, but three are from San Benito Island, off Baja California, and one collection from near San Clemente Island. A total of 164 specimens are represented in these collections. Among those collections from near Santa Catalina Island are several which were taken recently during the investigations mentioned in the first of this series of reports on opisthobranchs of this area, Mattox 1955. Careful study of these "slugs" resulted in the unquestionable decision that they represent an undescribed species of the genus *Philine*. This form is here designated as *Philine alba*.

Philine alba n. sp.

DESCRIPTION: The body form of the animal is typical of that of the suborder Cephalaspidea. The body is conspicuously divided into a large, oblong, fleshy head shield which extends posteriorly over the reflexed mantle region of the body (Fig. 1). Small, lateral epipodal folds extend dorsally between the head shield and the mantle region of the visceral hump. The posterior edge of the mantle is extended beyond the visceral hump as a short, smooth frill. The general body color of the living animal is a milky white tinted with spots of yellow-tan to pale pink. The median portion of the visceral mass is translucent through which the heart beat may be seen. Ventrally the foot is roundly truncate both anteriorly and posteriorly; it extends posteriorly only about four-fifths the body length. There are no tentacles. A pair of ridge-like rhinophores is found anteriorly on either side of the mouth in the groove between the body hump and the laterally

¹Allan Hancock Foundation Contribution No. 215.

extended foot. The eyes are internal and usually are not visible externally as they lie covered by the anterior muscles of the head fold. The total body length of the holotype is 52.8 mm, the head fold is 38.5 mm in length and the greatest body width is 40.5 mm.

In the deep groove between the foot and the cephalic disc on the right side are found the seminal groove and the anteriorly located penis. The penis is contained in a pocket situated antero-

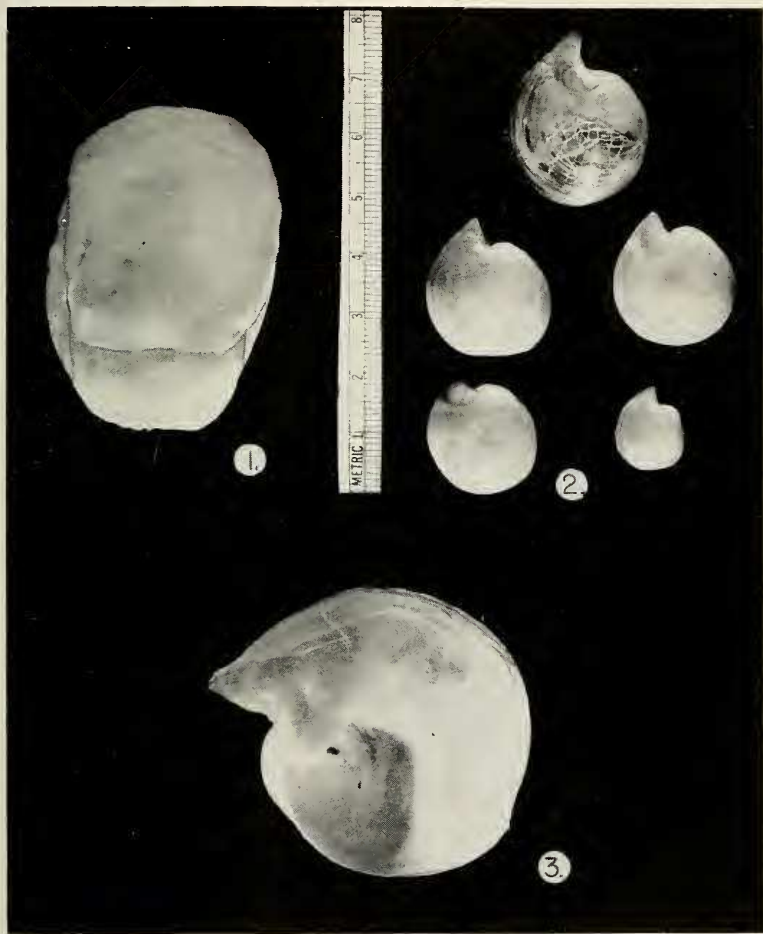


PLATE 33

1. Photograph of dorsal view of *Philine alba* (Holotype).
2. Photograph of the dorsal view of a series of shells of *P. alba*.
3. Photograph of the aperture view of a shell of *P. alba* (Paratype).

laterally below the right rhinophore. The mantle aperture is a long opening the anterior part of which opens into the groove between the epipodium and the visceral hump on the right side. The mantle cavity contains the ctenidium, the anus, renal opening and the genital aperture from which the seminal groove arises (Fig. 4).

The shell (Figs. 2 & 3) is capable of containing but a small part of the body, is entirely internal, and is covered by the reflexed and united mantle. It is white, thin, fragile, and smooth with faintly spiral striae. The outer surface is covered by a membranous periostracum. The shell is depressed, roundly ovate, one to two whorls in the small, open spire; the nucleus is covered by a shelly callus. The aperture is widely expanded anteriorly and laterally and extends into a rounded lobe above the posterior end of the spire (Fig. 3). This lobe is marked by an external elevated ridge and a groove extending from the region of the apex of the spire to the outer edge of the lobe (Fig. 2). The inner lip is very short, spread over the short pillar to the posterior callus. There is no pigmentation in the shell. There is no umbilical groove. In a paratype individual with a total body length of 50 mm the shell length is 23.3 mm with the aperture width of 20.0 mm and a dorso-ventral thickness of 8.5 mm (Fig. 3).

The internal anatomy is distinctive. The perivisceral body cavity is haemocoelic in character. The cavity consists of two main divisions, anterior and posterior, with a thin muscular "diaphragm" separating them (Fig. 4). The anterior cavity, under the cephalic shield, contains the buccal mass, the salivary glands, the crop, the gizzard, the nerve collar and ganglia, and the prostate gland. The posterior cavity is almost completely filled by the visceral mass: the digestive gland, gonad, digestive tract, heart, and accessory genital structures.

The mouth is situated medianly in the groove between the foot and the cephalic disc. The mouth opens into a very conspicuous buccal complex of muscles. This complex is divided into a dorsomedian mass which contains the radula and two lateral extensions of muscles (Fig. 4).

The radular ribbon is folded on the median line, thus there are no central (rachidian) teeth. In each row of teeth there are one pair of large lateral teeth and two pairs of smaller marginal teeth (uncini); giving a radular formula of 2-1-0-1-2 (Fig. 7). In all radulae examined there are 24 rows of teeth, a total of 144 teeth in the functional radula. The base of the lateral teeth is broad and flat. The head of the tooth extends medianly as a sickle-shaped point bent inward and posteriorly; there are serrations on the median edge. The base of the lateral teeth is ap-

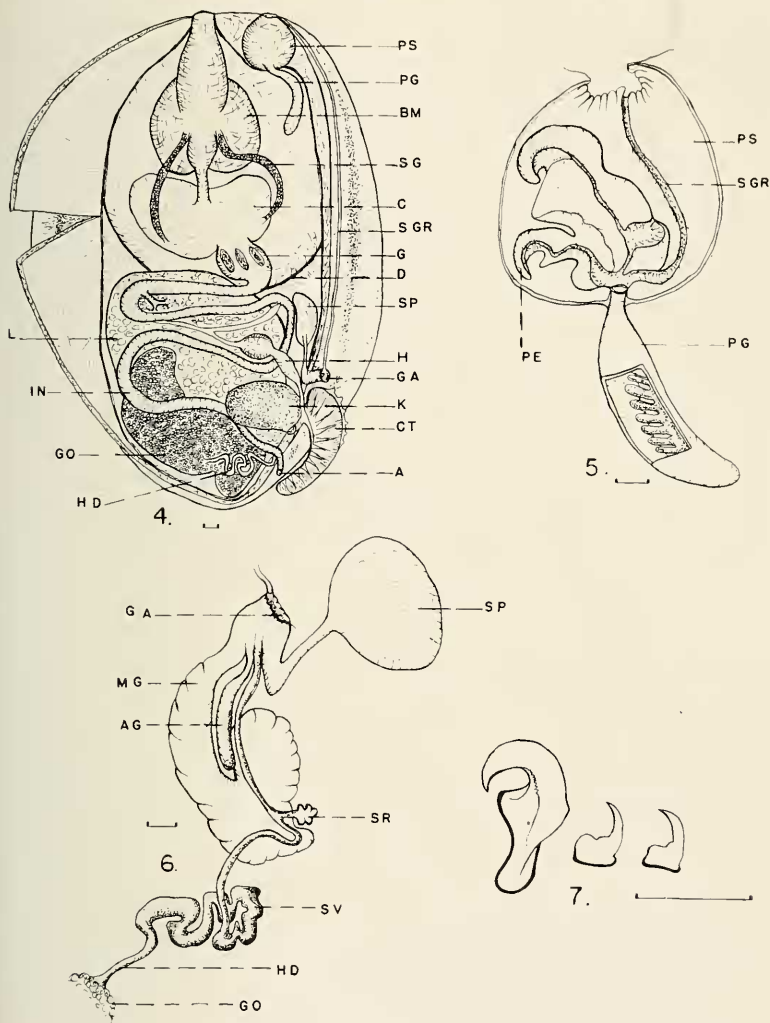


PLATE 34

4. Diagram of dorsal aspect of general internal anatomy of *Philine alba* (scale equals 1 mm).

5. Diagram of the penis and prostate gland of *P. alba* (scale 1 mm).

6. Diagram of the hermaphroditic organs of *P. alba* (scale 1 mm).

7. Lateral and marginal teeth of radula of *P. alba* (scale 0.5 mm).

Symbols used: A—anus; AG—albumin gland; BM—buccal mass; C—crop; CT—ctenidium; D—diaphragm; G—gizzard; GA—genital aperture; GO—gonad; H—heart; HD—hermaphroditic duct; IN—intestine; K—kidney; L—“liver” or digestive gland; MG—mucous gland; PE—penis; PG—prostate gland; PS—penial sheath; SG—salivary gland; SGR—seminal groove; SP—spermatheca; SR—seminal receptacle; SV—seminal vesicle.

proximately 0.5 mm in width, the head of the tooth is about 0.8 mm in length. The uncini are smaller and more simple in form. The base of the uncini is approximately 0.2 mm and the slightly curved head extends about 0.3 mm from the basal portion.

The digestive tract extends posteriorly from the buccal mass as a short esophageal tube which opens into a distended crop. A pair of salivary glands extend from the dorso-posterior region of the buccal mass to the dorso-lateral walls of the crop. The crop opens into a medianly located gizzard containing three gizzard plates, one dorsal and two lateral, embedded in the wall of the gizzard. Each plate is regularly elongate and oval measuring approximately 3.6 mm by 1.7 mm. The exposed and embedded convex surfaces of the plates are marked only by inconspicuous concentric striations. Posterior to the gizzard the digestive tube passes through the diaphragm and extends, as a stomach, over the anterior surface of the digestive gland where it receives the duct of the digestive gland. The digestive tract terminates in the mantle cavity after winding through the digestive gland and passing through the postero-lateral part of the body wall.

The gonad, an ovotestis, occupies the posterior third of the visceral mass (Fig. 4). The hermaphroditic duct arises from the dorsal surface of the posterior portion of the gonad. After passing anteriorly approximately 3 mm the duct convolutes and the walls thicken and become glandular, apparently serving as a seminal vesicle gland (Fig. 6). The hermaphroditic duct then passes laterally and enters the body wall. Within the body wall and in a ventro-lateral position the duct expands to form a small seminal receptacle before passing anteriorly to the genital vestibule inside the genital aperture. Entering the genital vestibule median and ventral to the opening of the hermaphroditic duct is a conspicuous mucous gland. Between the mucous gland and the terminal portion of the hermaphroditic duct lies an elongate, tubular albumen gland which also enters the genital vestibule. Lying in the body cavity anterior to the region of the genital aperture is the large, sac-like spermatheca connected by a tube which enters the lateral portion of the genital vestibule. Arising from the anterior edge of the genital aperture the seminal groove passes forward out of the mantle cavity into the area between the visceral hump and the right epipodium, on anteriorly between the right epipodium and the cephalic shield to the penis. The penis lies in a spherical pocket or sheath which opens externally to the right of the mouth and below the rhinophore. The penis is a T-shaped organ (Fig. 5). The seminal groove after entering the penial sheath passes to the tip of the posterior arm of the T. From the base of the penial sheath, which is embedded in the anterior body wall, the sac-like prostate gland extends into

the body cavity. The interior of the prostate gland contains a series of glandular ridges.

Philine are apparently protandric hermaphrodites. The sperm, after arising in the ovotestis, pass anteriorly out the genital aperture to the penial sheath. After receiving the secretions from the prostate the sperm are transferred by the penis into the genital aperture of another individual, thence into the spermatheca. After the termination of the sperm production period the sperm, which have been stored in the spermatheca, pass down to the seminal receptacle where they lie until needed to fertilize the eggs as they are produced and pass through the hermaphroditic duct. After fertilization the eggs receive albumen and mucous from those respective glands and are then deposited in an egg mass formed by the mucous which gels as it is extruded from the genital aperture.

The holotype, Hancock Foundation catalogue number 1030, and 17 paratypes, number 1031, were collected in 35 fathoms, 1.8 miles south-east of Long Point, Santa Catalina Island, on June 25, 1954, Velero station No. 2853-54. Other collections containing *Philine alba* were taken from 25 to 135 fathoms.

REMARKS: In 1772 Ascanius established the genus *Philine* to include the species *aperta* (Linne) as the type species by monotype. *Philine aperta*, a European species, has been the subject of study in several reports, notably by Vayssiere (1880), Guiart (1901), and Brown (1934) who gave excellent accounts of the anatomy of that species. To the best of the writer's knowledge the anatomy of other species has not been described, hence the anatomy of *P. alba* can be compared only to that of *P. aperta*.

Philine alba has a head shield which is much more extensive dorsally and is broader than that of *P. aperta*. The epipodal folds of *P. alba* are much smaller. The shell of *P. alba* is much more depressed, more circular in outline, and has a longer posterior lobe than typical *aperta*. The shell of *alba* is much larger than that of most *Philine*, a great deal larger than the only other species found in the eastern Pacific area, such as *P. californica* Willett (1944). The radula formula of *aperta* is given as 0-1-0-1-0 in contrast to 2-1-0-1-2 for *alba*. The gizzard plates of *alba* are much smaller, 3 mm, as compared to the length of 11 mm for *aperta*. The salivary glands of *aperta* are lobe-like instead of the ribbon form of *alba*. The basic plan of the hermaphroditic organs of *alba* is similar to that of *aperta* except for the very different form of the prostate gland of *alba*, sac-like in *alba* and elongate and tubular in *aperta*.

As indicated above, *P. alba* is much larger than any of the other local species known. The type specimen of *P. californica* measures 5.5 by 3.6 mm. The latticed sculpture of the shell and the broad, light-brown band across the shell makes *californica* different from *alba*. *Philine bakeri* Dall, listed from South Coronado Island, is 2 by 1.25 mm, and *P. hemphill* Dall, from off Cape San Quentin, Baja California, is 5 by 3 mm, both obviously much smaller than *Philine alba*.

REFERENCES

BROWN, H. H.

1934. IX.—A study of a tectibranch gasteropod mollusc, *Philine aperta* (L.). Trans. Roy. Soc. Eding. vol. 58 (1):179-210.

GUIART, J.

1901. Contribution a l'etude des gasteropodes opisthobranches et en particulier des cephalaspides. Mem. Soc. Zool. France, vol. 14:5-217.

MATTOX, N. T.

1955. Studies on the opisthobranchiata: I. A new species of the genus *Tritoniopsis* from southern California. Bull. So. Calif. Acad. Sci. vol. 54(1):8-13.

VAYSSIÈRE, J.

1880. Recherches anatomiques sur les mollusques de la famille des Bullides. Ann. Sc. Nat. Zool. ser. 6, vol. 9(1):1-123.

WILLETT, G.

1944. New species of mollusks from Redondo, California. Bull. So. Calif. Acad. Sc. vol. 43(2):71-73.

